Potential PEV Privacy Issues

Terms:

Recharge Point differentiates between recharge points that would be:

- "Private" – assigned to or owned by a customer (i.e. at home).
- "Public" – open for general use.

Payment Method differentiates between payment methods based on:

- "Rebilling Model" – bills would be rendered by the customer's "home" provider.
- "Fueling Station Model" – Payment would be made at the point of purchase via cash, check, credit card or some other method not yet devised. (e.g. a "utility PEV smart card" that could be used to pre-pay for PEV charging much as EZPass is pre-paid)

Also, we have endeavored to think in terms of *incremental* risks to privacy. How do Smart Grid and PEV use increase the number or kind of privacy threats over the current pre-SG/non-PEV situation?

Recharge Point ► Payment Method ▼	Private	Public
Rebilling	Few *incremental* issues, most data about customer is already known to energy provider.	Many *incremental* issues, as entities would have access to new data regarding customers habits, whereabouts, etc.
Fueling Station	Possibility of *incremental* issues, not much discussion on this option.	Few *incremental* issues, most data is already known to gas stations, credit card companies, etc.

With this matrix in mind, our questions currently are:

1. What data will be collected to initiate a charging point for a customer's personal use?
   a. How might this differ between a "private" charging point (i.e. a customer's residence) and a "public" charging point (i.e. one that the user only visits occasionally, or that is used by multiple users)?
   b. How might this differ between a "re-bill" scenario (where the customer's "home" utility bills for the recharge) and a "fueling

station" scenario (where the customer pays at the point of purchase, with cash or a credit card)?

c. How likely does it seem that either the amount of time the PEV was at the recharging station or data that could be used to determine this (i.e. power consumption that could be put through an algorithm to calculate an amount of time) will be collected and/or transmitted elsewhere?

2. Will the utility seek to purchase power back from the customer's charging point at times of peak demand? It is understood that they must purchase power generated by customers in some cases, but we do not know if this is the same for PEVs.
   a. What data will be collected if such energy trading takes place?

3. How likely is it the utility will seek to control the charging rate/cycle for the purpose of frequency or load regulation?
   a. What data will be collected (including a time measurement) if such control takes place?

4. Who will have control over the customer's charging point?
   a. Will a 3rd party (utility, government) be able to restrict the customer's access to his own charging point?
   b. Is it possible that control of the customer's charging point could be restricted/changed during an emergency situation or due to demand response needs?

5. Will other customers be able to use a personal charging point (i.e. recharging at a friend's house)?
   a. Will the electricity provider be able to differentiate between recharges?
   b. If so, how?

6. How can a customer restrict unauthorized uses of his charging point?
   a. Is this an issue being looked into by utilities and/or PEV manufacturers?

7. Will public charging points be available?
   a. If yes, what data will or might be collected on users at a public charging point?
   b. If yes, what payment systems will or might be put in place at a public charging point, and on which systems and networks will these payments take place?

There are various possible models for how a PEV will interact with the grid. They include:

- The simplest is that the homeowner establishes a suitable connection and a privately-controlled switch to turn it on and off. The utility knows nothing about it, and the homeowner pays for it just as for any other use in the home. This could also occur away from home, provided the owner of the connection allows the PEV to connect. It could be family, friends, tenants, customers, service providers, or whatever. For commercial instances, that might involve some kind of sub-metering where settlement is private between the connection owner and the PEV driver.
- The most complex is the "Vehicle-to-Grid" model in which the vehicle owner agrees to provide ancillary services (frequency regulation and backup generation) to the grid, either directly or through a third-party aggregator. In that case, the vehicle receives a version of the same signals any other ancillary services provider would receive and has a version of the same kind of account any other ancillary services provider would have. By a "version", I mean that a distribution management system or an aggregator would receive commands from the grid balancing authority and would allocate them to PEV's in accordance with the agreements established with the PEV owners. The PEV is essentially a mobile version of a Distributed Energy Resource (DER). The DMS or aggregator would monitor the PEV the same way it monitors any other DER.
- The V-to-G could become complicated in the mobile situation. At home, the capabilities of the vehicle and the terms, conditions, and constraints of the arrangement would be known to the grid. Away from home, those factors would have to be established at each instance of a connection. Also, the charging point owner could make arrangements with either the distribution utility or an aggregator, and there would have to be some way of figuring out what the particular arrangements were for that connection. It could be at least as varied as making a landline telephone call away from home or office (e.g., pay phone ownership and arrangements; hotels providing calls included in room rate; hotels treating phone services as a profit center and establishing a variety of fees, restrictions, default long distance carriers, and other conditions).

Specific questions:

1. It could be as little as nothing and as much as vehicle identity, capabilities, and pre-existing arrangements; driver identity and settlement details; date, time, duration, and energy usage or V-to-G ancillary services provided.
   a. Depends on arrangements/agreements and vehicle capabilities

   b. Depends on arrangements/agreements and vehicle capabilities
   c. Highly likely, depending on arrangements/agreements
2. That is what V-to-G is all about
   a. Could be the same data as any other generation plant
3. Depends on arrangements/agreements and vehicle capabilities
   a. Periodic SCADA monitoring and control. Technical parameters depend on arrangements/agreements and vehicle capabilities
4. Depends on arrangements/agreements and vehicle capabilities.
   a. Issue is not only restriction but mandate. One V-to-G scenario has PEV's providing emergency black-start capability to the grid.
   b. Same as (a).
5. Highly likely.
   a. Depends on arrangements/agreements and vehicle capabilities.
   b. Same as (a).
6. Depends on arrangements/agreements and vehicle capabilities.
   a. They better be, or the PEV concept will not work.
7. Yes, they will be needed or very few people will buy PEV's and the US will fail to achieve their energy independence and national security benefits.
   a. The possibilities are wide open
   b. The possibilities are wide open